MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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Gaithersburg, Maryland 20899

SRM Number: 1684b
MSDS Number: 1684b
SRM Name: Nitric Oxide in Nitrogen
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Nitric Oxide in Nitrogen

Description: This SRM is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psi), which provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. The cylinder conforms to DOT specifications and is equipped with a CGA-660 stainless steel valve, which is the recommended outlet for a nitric oxide mixture.

Other Designations: Nitric Oxide (nitrogen monoxide) in **Nitrogen**

Name	Chemical Formula	CAS Registry Number
Nitric Oxide	NO	10102-43-9
Nitrogen	N_2	7727-37-9

DOT Classification: Compressed Gas, N.O.S., (nitric oxide; nitrogen) UN1956

Manufacturer/Supplier: Available from a number of suppliers

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Component	Nominal Concentration	Limits and Toxicity Data
Nitric Oxide	100 µmol/mol	ACGIH TLV: 25 µg/kg
		OSHA TLV-TWA (PEL): 25 µg/kg
		Rat, Inhalation LC_{50}: 1068 mg/m^3/4 h
		Rat, Inhalation LC_{50}: 115 µg/kg
Nitrogen	balance	Simple asphyxiant

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Oxide	Nitrogen
Appearance and Odor: colorless with a sweet order	**Appearance and Odor:** colorless, odorless, tasteless gas
Relative Molecular Mass: 30.01	**Relative Molecular Mass:** 28.01
Physical State: gas	**Physical State:** gas
Vapor Density (Air = 1): 0.968	**Vapor Density (Air = 1):** 0.967
Vapor Pressure: not available	**Vapor Pressure (760 mm Hg):** 196 °C
Boiling Point: not available	**Boiling Point:** -196 °C
Odor Threshold: (0.27 to 0.9) µmol/mol	**Odor Threshold:** not available
Water Solubility (@ 20 °C): 1.485 cm^3/100 cm^3 H_2O	**Water Solubility (@ 20 °C):** 1.6 %
Solvent Solubility: liquid ammonia	**Solvent Solubility:** liquid ammonia

NOTE: The physical properties are for the pure components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: Nonflammable **Method Used:** Not applicable **Autoignition Temperature:** Not applicable

Flammability Limits in Air (Volume %): **UPPER:** Not applicable
LOWER: Not applicable

Extinguishing Media: Use extinguishing media that is appropriate to the surrounding fire.

Hazardous Combustion Products: When nitric oxide comes in contact with air, highly toxic fumes of NO_x are emitted.

Special Fire Procedures: Fire fighters should wear full protective clothing and (SCBA) when this material is involved in a fire. Keep fire cylinders cool with water spray. If possible, stop the product flow.

Unusual Fire and Explosion Hazards: Nitric oxide and nitrogen are negligible fire hazards; however, mixtures of ozone and nitrogen may be explosive. Titanium is the only element that will burn in nitrogen. Cylinders may rupture under fire conditions.

SECTION V. REACTIVITY DATA

Stability: **X** **Stable** ____ **Unstable**

Conditions to Avoid: Avoid storage in poorly ventilated areas or near a heat source.

Incompatibility (Materials to Avoid): Reacts with organic and reducing materials. Nitrogen reacts with lithium, neodymium, and titanium at high temperatures.

See Section IV: *Fire and Explosion Hazard Data*

Hazardous Decomposition or Byproducts: In contact with air, nitric oxide forms toxic fumes of NO_x.

Hazardous Polymerization: ____ **Will Occur** **X** **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: **X** **Inhalation** **X** **Skin** ____ **Ingestion**

Health Hazards: This material is a high pressure gas that can cause rapid suffocation. This gas may also cause eye, skin, and respiratory tract burns.

Acute Effects: The mixture can act as a simple asphyxiant by displacing air necessary for life. Nitric oxide forms acids in the lungs, which are irritants that cause congestion of the throat and bronchi and edema of the lungs. Symptoms include headache, lowering of blood pressure, dizziness, development of cyanosis, and loss of consciousness. Because of its minor irritating affects on the upper respiratory tract, the warning properties are limited.

Chronic Effects: Nitric oxide may cause permanent decrements in pulmonary function.

Medical Conditions Generally Aggravated by Exposure: None known

Other Effects of Overexposure: Not applicable

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Rinse affected area with copious amounts of water for at least 15 minutes. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

Inhalation: Immediately remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Lay victim with head and chest lower than hips to improve drainage of fluids from the lungs. Obtain medical assistance if necessary.

Ingestion: Not applicable

NOTE: Signs and symptoms of pulmonary edema can be delayed for several hours.

TARGET ORGAN(S) OF ATTACK: eyes, skin, upper respiratory tract, and mucous membranes

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released: Evacuate and ventilate area. Remove leaking cylinder to exhaust hood or safe outdoor area. Shut off source if possible and remove source of heat. In case of leakage, use SCBA. Leaks of nitric oxide are detectable by the formation of reddish-brown NO_2.

Waste Disposal: The cylinder is the property of the purchaser. Dispose of non refillable cylinders in accordance with federal, state, and local regulations. Allow gas to vent slowly to atmosphere in an unconfined area or exhaust hood. **DO NOT** reuse the empty cylinder; the empty cylinder will contain residue.

Handling and Storage: Secure cylinder when using to protect from falling. Use suitable hand truck to move cylinders. Wear safety shoes when handling cylinders. Use adequate general and local exhaust ventilation to maintain concentrations below exposure limits and to avoid asphyxiation. A chemical safety shower and an eyewash station must be readily available. For protection of eyes, wear safety glasses.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store in well ventilated areas away from combustibles. Keep valve protection cap on cylinders when not in use.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Source: Scott Specialty Gases, MSDS *Nitric Oxide in Nitrogen*, 02 October 1997.
MDL Information Systems, MSDS *Nitrogen*, Compressed Gas, 02 June 2000.
MDL Information Systems, MSDS *Nitrice Oixde*.

Disclaimer: Physical and chemical data contained in this MSDS are provided for use in assessing the hazardous nature of the material. The MSDS was prepared carefully using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given only on the NIST Certificate of Analysis.